

TOSHIBA INTERNATIONAL CORPORATION

1800 Series Single Phase Uninterruptible Power Systems

Product Specifications – Rev 3.0 August 2008

2.4 kVA

1.0 Scope

This specification describes the Toshiba On-Line Uninterruptible Power System (UPS), 1800 Series. The series will supply a computer grade AC output sine wave which is unaffected by the quality of the AC input. The input voltage is single phase and the output voltage is single phase.

2.0 General Operation

Under normal operating conditions, the UPS' rectifier converts alternating current (AC power) to direct current (DC power), which is required for the system's inverter and battery charger. The charger supplies regulated DC power to keep the batteries constantly charged. The inverter uses pulse width modulation (PWM) that fully utilizes the characteristics of insulated-gate bipolar transistors (IGBT) to convert DC power to regulated AC power. Therefore there is a constant supply of power. The batteries will instantaneously supply the inverter DC power should an AC power line failure occur.

2.1 Performance Standards

The UPS is designed with the applicable sections of UL, CUL, and ISO 9001 14001. The UPS has UL, CUL and CE listing.

3.0 General

3.1 Materials

All materials used are of new manufacture using the latest technology and has not been in prior service except for specified factory testing. IGBT's (insulated-gate bipolar transistors) are used exclusively in inverter sections.

3.2 Components

All functioning components are solid state with no moving parts.

3.3 Installation

The installation of the UPS complies with the UPS manufacturer's recommendations that are supplied with the delivery of the UPS. The UPS complies with Local electrical codes and the National Electric Code. All wiring complies exactly with what is specified.

3.4 Assembly

The UPS is delivered fully assembled and be fully functional.

4.0 System Theory and Operation

4.1 Theory

AC input from the utility system is converted into DC power. The stepped up DC power is then converted to AC power by the inverter. The output voltage waveform of the inverter will be the pulse voltage waveform modulated by the PWM control using the 37.5 kHz switching frequency sine wave. The PWM-Modulated voltage waveform is transformed into a sine voltage waveform by the inductive component of the inverter inductor and by the capacitive component of the capacitor filter. The inverter uses the

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IGBT with a self-extinguishing function and a high switching speed. Optional input and output transformers for extra power conditioning.

4.2 Modes of Operation

4.2.1 Emergency (Battery Backup)

In the event the AC power from the utility system fails, the DC power is supplied from the batteries to the chopper and to the inverter to provide a continued and stable AC power supply to the load without interruption.

4.2.2 Normal (Inverter)

The rectifier converts AC to DC to power the inverter, which supplies power to the critical load and simultaneously float charges the batteries.

4.2.3 Battery Charge

The charger will float charge the batteries in normal and bypass modes.

4.2.4 Static Bypass

If the UPS unit is in severely overloaded or develops an internal fault, power is automatically switched from the units' main circuit to the bypass circuit. Power is conditioned by line filters, and the isolation transformer during static bypass operation.

5.0 UPS Input

5.1 System Rating The UPS is sized to supply a load with a power factor of 0.70.

5.2 Electrical Requirements

Voltage: 208/240 VAC Single Phase

Voltage Range : 240V: 144V~264V (+10% to -40%)
: 208V: 125V~228V (+10% to -40%)

Frequency: 50 or 60 Hz \pm 3Hz

Power Factor: Greater than 0.95

Input Total Harmonic Distortion: Less than 5% (current)

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6.0 UPS Output

Voltage: 208/240 VAC Single Phase

Capacity: kVA kW (@ 0.70PF)
2.4 kVA (208/240V) 1596W

Regulation: +/-3% (with AC power and during battery backup)

Distortion: Less than 3% THD at full Linear Load

Step Load: $\pm 9\%$ max from 100% to 0 % or from 0% to 100 % linear load

Output Current:	<u>kVA</u>	<u>RMS</u>	<u>PEAK</u>
	2.4 (240V)	9.5A	23.75A

Overload Capacity (Inverter): 150% for 30 seconds
125% for 60 seconds

Crest Factor: 2.5 at Full Load

Frequency: 50/60Hz Auto Sensing

Regulation: $\pm 0.5\text{Hz}$

Synchronous Range: +/- 1 Hz

Wave Form: Sine wave, Zero Transfer Time

Load Power Factor: 0.7 lagging

Efficiency AC to AC: Greater than 79% (208/240V)

Noise Isolation: Neutral is bonded to ground on the output of the Isolation transformer
for isolation of common mode

Bypass: Manual bypass provided with switch with less than 4 ms transfer

7.0 UPS Battery

Battery Bus Volts: 48 VDC nominal

Backup time: 7 minutes

Type of Battery: Enersys NPX-35 Flame Retardant Lead Acid 9Ah/12V

Number of Battery: 2 Strings in Parallel, 4 batteries per String

Average Recharge: 9 hours (3.5 hours for 90%)

Cutoff Voltage: 1.6 Volts per cell

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8.0 System Status and Control Indicators

8.1 Panel

The UPS has a panel on the front for complete monitoring control of UPS.

Operation panel features:

- 1) Run/Stop button
- 2) AC input voltage indicator
- 3) Inverter status indicator
- 4) Alarm indicator
- 5) Fault indicator
- 6) LED

Warning messages:

- 1) Low Battery
- 2) Current limit
- 3) Ambient Over Heat
- 4) Battery Over Heat
- 5) Input Over Voltage
- 6) Input Frequency Regulation
- 7) Output Overload

Fault Messages:

- 1) Replace Battery
- 2) Battery Shutdown
- 3) DC Bus Over Current
- 4) DC Bus Over Voltage
- 5) DC Bus Imbalance
- 6) Output Under Voltage
- 7) Output Over Voltage
- 8) System Over Heat

9.0 Dimensions

<u>Tower</u>	<u>1.5 kVA</u>	<u>2.0 kVA</u>	<u>2.4 kVA</u>
Weight	170 lbs	170 lbs	170 lbs
Width	10"	10"	10"
Depth	27"	27"	27"
Height	23.5"	23.5"	23.5"

10.0 Communications

10.1 Dry Contact Communication

The remote interface is a standard feature. Signals are available through a DB9 male connector.

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- 1) AC input present
- 2) Battery operation
- 3) Inverter
- 4) Bypass active
- 5) Fault
- 6) Loss of utility

10.2 RS-232C Communication

The RS-232C serial communication interface is available through a DB9 female connector. The interface allows control of the UPS from a personal computer running special Toshiba software.

10.3 EPO Control

The UPS comes with terminals on its rear side for receiving an Emergency Power Off (EPO) and Remote Run/Stop command from a remote locations.

11.0 Reliability

Demonstrated mean time between failures (MTBF) of 200,000 hours.

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12.0 Environment Operation

Operating Ambient Temperature:	0 ~ 40°C (32 ~ 104°F)
Recommended Temperature:	+15°C ~ 25°C
Storage Temperature:	-20°C ~ 40°C
Humidity:	30-90%, Non-Condensing
Audible Noise:	50dB (A) maximum @ 1 meter from Front Panel
Altitude:	1000 m (3,000 ft) above sea level

13.0 Conformance

UL 1778, CUL, CE, FCC Part 15 Class A

14.0 Warranty

Toshiba Standard warranty includes 3 Years of on site service which covers electronics and labor, and a 5 year warranty on the batteries (2 years full, 3 years pro-rated)

15.0 Options

15.1 Remote Monitoring

The UPS contains a communication slot this allows the operator to field install an optional RemotEye II card. The RemotEye II card allows the UPS to communicate via Ethernet SNMP, connected directly to the Local Area Network. SNMP/ Web based monitoring – Toshiba UPS system provides comprehensive monitoring of the UPS operation. The optional RemotEye II features an HTTP (web-based) interface for Toshiba UPS. This allows easy access to the Toshiba UPS information from any PC/Network with a web browser.

15.2 Environmental Monitoring Device (EMD)

The EMD is an environmental monitoring device that provides remote monitoring of temperature, humidity and other environmental conditions via standard web browser or network management systems. The EMD provides automated events notification when temperature, humidity or user defined dry contacts is out of configured tolerance.